Dear Eric, 3-4-07

As I mentioned previously, my son Eric was to stop in at the Boston Public Library on his visit to town and research the Perkins' Patents there. This we spoke about perhaps 3-4 months ago just before the discovery of the Bowen imprints, if I am not mistaken.

His visit resulted in this information which came out of the "London Journal of Arts and Sciences" and represents all they could find on the subject. This looks somewhat similar to the #4400 Patent but not exactly like it. I am copying the pages in the exact sequence they were given to me. You will notice some of the text is repeated on the following page as the librarian had to copy from "microcards" and not page size originals.

I guess this concludes the patent searches we began some time ago. This may or may not be all that is available but it is all that I could find. The Bowen patents (if there ever were any) may have gone up in smoke in 1836 in the Patent Office fire.

There is a good chance I will be seeing Anne Bentley and Dave Bowers at the next combined meeting of the Currency Club of New England and the Boston Numismatic Society on April 9th. John Adams of Boston will be speaking on Early Colonial Medals that night. If there is any other information you think they could supply or help to find I would be happy to ask their help.

I hope all is well with you and yours,

Regards,

John

John

Boston Public Library

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23 February 2007

John Ferreri
P. O. Box 33
Storrs, CT 06268

Dear Mr. Ferreri:

At your son Eric's instruction I am forwarding copies of a Jacob Perkins patent from the "London Journal of Arts and Sciences". The copy was made from a microcard in the "Landmarks of Science" collection held by our Microtext Dept. Microcards being now a somewhat obsolete technology there is some difficulty in making copies which explains the rather poor quality of the images. It was also necessary, when scanning, to break up the pages which explains some repetition of part of the page on the subsequent image. I hope it is not too difficult to follow.

continued

THE

London

JOURNAL OF ARTS AND SCIENCES.

No. III.

Recent Patents.

To JACOB PERKINS, *late of Philadelphia, in the United States of America, but now of Austin Friars, in the City of London, Mechanist, for certain Machinery and Implements applicable to the transferring of engraved or other Work from the surface of one piece of Metal to another piece of Metal; and to the forming of Metallic Dies and Matrices. And also Improvements in the Construction and Method of using Plates and Presses for Bank Notes and other Papers, whereby the producing and combining various species of Work is effected upon the same Plates and Surfaces, the difficulty of imitation increased, and the process of printing facili-*

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THESE inventions consist of five parts, viz. first, certain combinations of mechanical powers for the purpose of

constructing presses whereby engravings upon plates or blocks of hardened steel may be transferred to rollers, blocks, or plates of soft steel; second, improvements in the construction of printing presses, and facilities in the modes of using them as applicable particularly to the production of Bank notes; third, apparatus for the purposes of coining money and stamping medals, &c.; fourth, certain methods of softening steel for the purpose of engraving upon and afterwards of hardening the same to produce dies or punches; fifth, improved lathes for turning and engraving geometrical figures and ornamental scroll work.

The claims of the present Patentee are for improvements upon a former Patent obtained by Mr. J. C. Dyer, in 1810, (this gentleman being the agent of Mr. Perkins,) in which, under the title of "*certain improvements in the construction and method of using Plates and Presses, and for combining various species of work in the same Plate for the kind of printing, usually called copper plate printing, designed for the object of detecting counterfeits, for multiplying impressions, and saving labour,*" are described plates or blocks of steel rendered fit to receive engravings of various kinds, particularly for Bank notes, checks, and lottery tickets; and also of a method of hardening the said plates or blocks after they have

mental scroll work.

The claims of the present Patentee are for improvements upon a former Patent obtained by Mr. J. C. Dyer, in 1810, (this gentleman being the agent of Mr. Perkins,) in which, under the title of "*certain improvements in the construction and method of using Plates and Presses, and for combining various species of work in the same Plate for the kind of printing, usually called copper plate printing, designed for the object of detecting counterfeits, for multiplying impressions, and saving labour,*" are described plates or blocks of steel rendered fit to receive engravings of various kinds, particularly for Bank notes, checks, and lottery tickets; and also of a method of hardening the said plates or blocks after they have been so engraved, whereby the work upon the plate is rendered durable; and also of taking reverses of the same plates upon soft steel, which are therein denominated *Perkins's Stereographic Steel Plates.* And likewise presses constructed expressly for the purpose of printing from these plates. The nature of these improvements and their detail will be fully understood by the plates referring hereto, and the following description communicated by the Patentee himself.

Plate VIII. Fig. 1, represents the horizontal vibrating lever press, viewed in front. Fig. 2, a top view, with all the parts in the situation, as in use; B, B, &c. the four upright sides of the frame of the Press, tenoned into the base or sill C, and strengthened by the cross beams D, D; upon the top of the sides B, B, is the press bed E, E, which is secured to the sides by screws and nuts, and has two grooves or slits F, F, in it, for the two upright bars G, G, and H, H, to pass through and move freely therein backwards and forwards. The bar H, H turns upon the pin or bolt I, as a fulcrum, which is supported in blocks, fixed to the sides of the frame B, B; the bar H, H, passing through one of the grooves F, in the press bed E, E, is connected, by means of the joint, with one end of the vibrating lever K; the other end of which, is connected with the upper end of the upright bar G, G, by the joint L; the bar G, G, is connected with the lower horizontal lever M, by the bolt N; this lever M, moves upon the bolt O, as a fulcrum, which rests in one of the sides of the frame B; to the other end of the lever M, is connected by the joint P, the rod Q, Q, having firmly fixed in the middle of its upper end, a short rounded plate of iron R, upon which the lever T, presses, one end of which lever, lodges under

freely therein backwards and forwards. The bar H, H turns upon the pin or bolt I, as a fulcrum, which is supported in blocks, fixed to the sides of the frame B, B; the bar H, H, passing through one of the grooves F, in the press bed E, E, is connected, by means of the joint, with one end of the vibrating lever K; the other end of which, is connected with the upper end of the upright bar G, G, by the joint L; the bar G, G, is connected with the lower horizontal lever M, by the bolt N; this lever M, moves upon the bolt O, as a fulcrum, which rests in one of the sides of the frame B: to the other end of the lever M, is connected by the joint P, the rod Q, Q, having firmly fixed in the middle of its upper end, a short rounded plate of iron R, upon which the lever T, presses, one end of which lever, lodges under one of the pins or staves U, U, which are fixed in the side of the frame B, and the side piece V, attached to it; and upon the other end of it, the weight W, hangs, and can be slided along it, as required in use. The upper side of the lever T, has a semi-circular notch or gap in it, at its end, which lodges under one of the pins or staves U, U, and on the under side of it, near that end, are made several other similar notches, any one of which, can be placed upon the rounded edge of the plate R, of the rod Q, as may be required to increase or lessen the

pressure. The press bed E, E, is supported near its centre, upon the top of the strengthening frame X,X,X; and has two ribs Y, Y, cast upon it, on which rests the adjustable bed Z, the under side of which, is formed of a portion of a cylinder; and in the centre of it, is screwed the arm *a*, to which is jointed the socket or tube *b*, having a female screw within it, in which acts the male screw *c*, the cylindrical stem of which, acts in a hole made in the plate, *d*, which has two pivots moving in the ears, *e*, *e*, which are screwed into the underside of the press bed, and thus allows sufficient play to those parts in use. The adjustable bed Z, can be moved sideways, backwards, and forwards, by turning the winch *f*, of the screw *c*. Upon the adjustable bed Z, is supported the bed *g*, by means of the four screws, *h*, *h*, *h*, *h*, which are screwed into the bed *g*, and their heads project into four shallow circular holes, made in the top of the adjustable bed Z, to receive them, two of which are shewn at *i*, *i*. Upon the upper face of the bed, *g*, is to be placed the copper or steel plate to receive the impression from the circular die or roller *j*, which is suspended from the under side of the middle of the vibrating lever K, in the manner now to be described. The die or roller *j*, consists of a hollow steel cylinder, fitted upon a steel axis

press bed, and thus allows sufficient play to those parts in use. The adjustable bed Z, can be moved sideways, backwards, and forwards, by turning the winch *f*, of the screw *c*. Upon the adjustable bed Z, is supported the bed *g*, by means of the four screws, *h*, *h*, *h*, *h*, which are screwed into the bed *g*, and their heads project into four shallow circular holes, made in the top of the adjustable bed Z, to receive them, two of which are shewn at *i*, *i*. Upon the upper face of the bed, *g*, is to be placed the copper or steel plate to receive the impression from the circular die or roller *j*, which is suspended from the under side of the middle of the vibrating lever K, in the manner now to be described. The die or roller *j*, consists of a hollow steel cylinder, fitted upon a steel axis, which is formed into two cylindrical necks on each side of the roller, as shewn at *k*, *k*. On the underside of the vibrating lever K, is secured by screws, a brass bearing box *l*, in which are two semi-circular gaps or notches, which receive the necks *k*, *k*, of the roller's axis; the roller *j*, is kept up, and prevented from falling out of these gaps, by means of the wire stirrups *m*, which has two hooks at its lower ends, which take hold of those parts of the neck, *k*, *k*, that extend beyond the bearing box *l*; and the stirrup itself hangs upon a wedge *n*, which is

placed between it, and the top of the vibrating lever K. Each end of the axis of the die or roller is made square, on which squares fit the square gaps made in the ends of the die lever, and by means of which, the die or roller can be turned backwards and forwards, upon the surface of the steel or copper plate *w*, lying upon the bed *g*, as aforesaid.

When the weight W, and the lever T, are removed, the rod Q, may be lifted up by means of its handle *p*; in order, however, to facilitate this, and retain the rod at any required height, a counterbalancing weight *q*, is suspended by the line *r*, which passes over the pulley *s*, and is connected with the longer end of the horizontal lever M, by the loop *t*. In order to lessen the friction of the upright bars G,G and H,H, in the grooves F,F, made in the press bed E,E, these grooves are covered with two brass plates *u*,*u*, having a corresponding groove in each, but which are made rather narrower than those grooves in the bed over which they are placed. These brass plates *u*, *u*, are firmly secured upon the bed, by the screws *v*, *v*, &c. The length of this press ought to be at least, fifteen feet, in order to allow the vibrating lever to move sufficiently near to a straight line to answer its intended purpose; the difference, however, between the

and is connected with the longer end of the horizontal lever M, by the loop *t*. In order to lessen the friction of the upright bars G,G and H,H, in the grooves F,F, made in the press bed E,E, these grooves are covered with two brass plates *u*,*u*, having a corresponding groove in each, but which are made rather narrower than those grooves in the bed over which they are placed. These brass plates *u*, *u*, are firmly secured upon the bed, by the screws *v*, *v*, &c. The length of this press ought to be at least, fifteen feet, in order to allow the vibrating lever to move sufficiently near to a straight line to answer its intended purpose; the difference, however, between its motion and a straight line, is compensated for, partly by the materials, viz. wood, of which its frame consists, but chiefly by the accommodating motion of the levers, and it therefore becomes necessary in using it, to place it so as to pass through the floor of the work-room in which it is situated, to the room below, and even to raise the floor of the work-room by means of a platform, for the operator to stand upon, and as shewn in the plate.

Plate VIII. Fig. 3, shews an improved steel or copper plate, or block printing press. The principal improvements, consist in a new method of heating the

plate or block; in the use of a tympan, for the purpose of saving the expense of making the plates or blocks any larger than is necessary to receive the engraving: as well as to save ink, and also time and labour in changing the plates or blocks. The manner in which these objects are effected will appear from an inspection of the plates, and the following description thereof. A, A, &c. is the cast iron frame of the press; B, the upper cast iron roller, on the axis of which is fixed the wheel C, with handles around it, for the workman to pull by; D, the lower cast iron roller; E, F, the bed of the press, made partly of cast iron, and partly of wood; the part E, is of cast iron, the better to resist the pressure of the rollers, and to convey the heat employed to warm the plate or block, as described hereafter: the plate or block G, is fixed upon the bed, by means of screws, passing through countersunk holes made in the bed, from the underside of it, and into screwed holes, made partly through the plate or block itself. The tympan, H, is a wooden frame, covered with copper, and turning upon the hinges, I, I, and having an aperture in it large enough to include the plate or block, the sides of which aperture are made feather-edged, so as to overlap the bevelled edges of the plate or block, and prevent them from soiling the

partly of cast iron, and partly of wood; the part E, is of cast iron, the better to resist the pressure of the rollers, and to convey the heat employed to warm the plate or block, as described hereafter: the plate or block G, is fixed upon the bed, by means of screws, passing through countersunk holes made in the bed, from the underside of it, and into screwed holes, made partly through the plate or block itself. The tympan, H, is a wooden frame, covered with copper, and turning upon the hinges, I, I, and having an aperture in it large enough to inclose the plate or block, the sides of which aperture are made feather-edged, so as to overlap the bevelled edges of the plate or block, and prevent them from soiling the paper. The cast iron part of the bed of the press, with the plate or block upon it, is heated by means of a block of cast iron J, which is supported upon the plate K, with turned-up edges, and which block is removed and replaced by another, from time to time as it cools. In use, the frame of the press is inclined, the front end, resting upon the floor, and the other end being raised by two screws, passing through screwed holes in the sill of the press frame, one of which screws is shewn at L: the intention of this inclination is, to cause the bed to return after the impression is made, of its own accord; and in

(13)

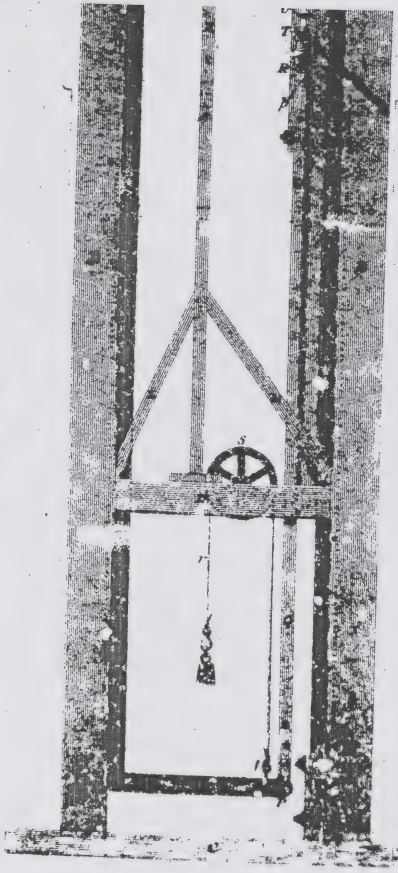
order to admit of this, a portion of the roller B, is removed; and three pairs of additional rollers M, M, M, are added, for the bed to roll upon with more facility; each pair of rollers being fixed upon a separate axis, with necks, working in brasses. The blankets N, N, are secured to the cast iron bed, at one end, by the blanket-holder O; and a stretcher P, is affixed to the other end of them; from which cords Q, Q, pass over the pullies R, R, and have weights, (one of which is shewn at S,) hung to them; by this means, the blankets are kept stretched, and relieved from the roller, and prevented from matting or becoming dirty in use. The roller B, is kept up when the bed is released by the following contrivance: T, T, are two wooden blocks, lying at the bottom of the chases, in the press frame; into each of these blocks is fitted a screwed nut, into which are screwed two screws, having flat cylindrical heads, W, W, with notches or teeth cut around them, and which project beyond the sides of the press frame, so as to be easily turned either way, as required. Upon these heads, the brasses X, X, are rests, in which the necks of the axis of the roller B, turn; and the roller can thereby be

vented from matting or becoming dirty in use. The roller B, is kept up when the bed is released by the following contrivance: T, T, are two wooden blocks, lying at the bottom of the chases, in the press frame; into each of these blocks is fitted a screwed nut, into which are screwed two screws, having flat cylindrical heads, W, W, with notches or teeth cut around them, and which project beyond the sides of the press frame, so as to be easily turned either way, as required. Upon these heads, the brasses X, X, are rests, in which the necks of the axis of the roller B, turn; and the roller can thereby be supported at the required height, as above mentioned.

At Plate VIII. Fig. 4, is represented a cylindrical steel, or copper-plate printing-press. A. A. &c. is the cast iron frame of the press. B, the main cylinder for holding the plates; which has a solid cast iron cylindrical surface or rim, upon which the plates are firmly secured, by means of screws passing through holes, made in the surface of the cylinder, from the inside of it; and entering into screwed holes, made partly through the plates. The main cylinder is mounted on an axis, with necks on each end of it, turning in brasses, fixed upon the tops of the two main upright standards of the

frame. C, is the small cast iron pressing cylinder, having necks upon its axis, turning in sliding brasses, which can be adjusted, so as to press with more or less force against the main cylinder B, by the screws; one of which is shewn at D. E, E, is the endless web, or blanket, passing over, and carried forwards, by the pressing cylinder C, and over the web cylinder F; the necks of the axis of which cylinder turn in brasses, fitted into sliding carriages, with adjusting screws; one of which is shewn at G, for stretching the web. Upon the extended axis of the pressing cylinder C, is fixed the drum, or rigger H, which is driven by a band I, I, receiving its motion from the moving power. The plates J, J, &c. are inked by the roller K, coming into contact with them in succession, as the main cylinder revolves; and which roller is inked from the distributing rollers L, and M, the latter of which receives the ink, in the usual manner of machine typographic printing presses, from a trough and ductor; and which, therefore, need not be here shewn. The ink is more uniformly distributed over the plates by a hand roller, used by a workman. Another ductor N, is supported by brackets at each end of it, to the main standards of the frame, (one of which is shewn at O,) in the usual manner of calico printing

[illegible] of the pressing cylinder C, is inked the drum, or rigger H, which is driven by a band I, I, receiving its motion from the moving power. The plates J, J, &c. are inked by the roller K, coming into contact with them in succession, as the main cylinder revolves; and which roller is inked from the distributing rollers L, and M, the latter of which receives the ink, in the usual manner of machine typographic printing presses, from a trough and ductor; and which, therefore, need not be here shewn. The ink is more uniformly distributed over the plates by a hand roller, used by a workman. Another ductor N, is supported by brackets at each end of it, to the main standards of the frame, (one of which is shewn at O,) in the usual manner of calico printing, and therefore need not be shewn here: this last mentioned ductor N, scrapes or takes off the larger portion of the ink, lying upon the surfaces of the plates; the remainder being removed by several persons wiping it off in succession; and finally, cleaning their surfaces, much in the same way, as in copper-plate printing. The paper properly moistened, may be either laid upon the revolving web or blanket E, E, in sheets, and be taken away when printed; or may be in the form of one or more long sheets, which must be previously wound upon



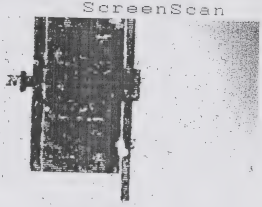


Fig. 6.

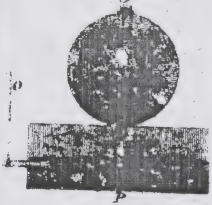


Fig. 8.

Plate VIII

Fig. 2.

Fig. 5.

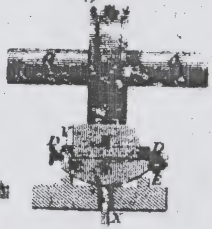


Fig. 1.

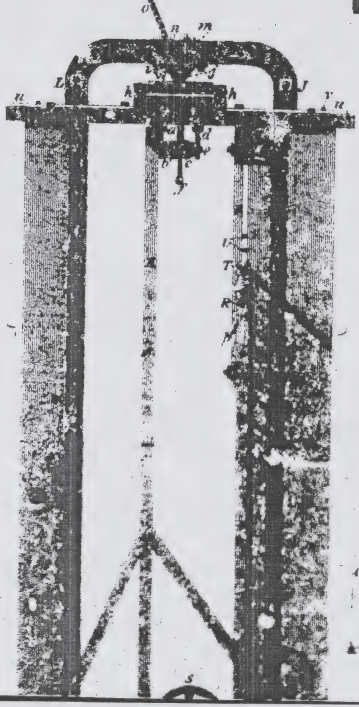
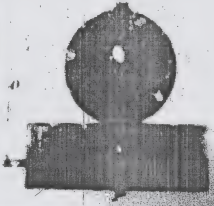


Fig. 7.

Fig. 6.



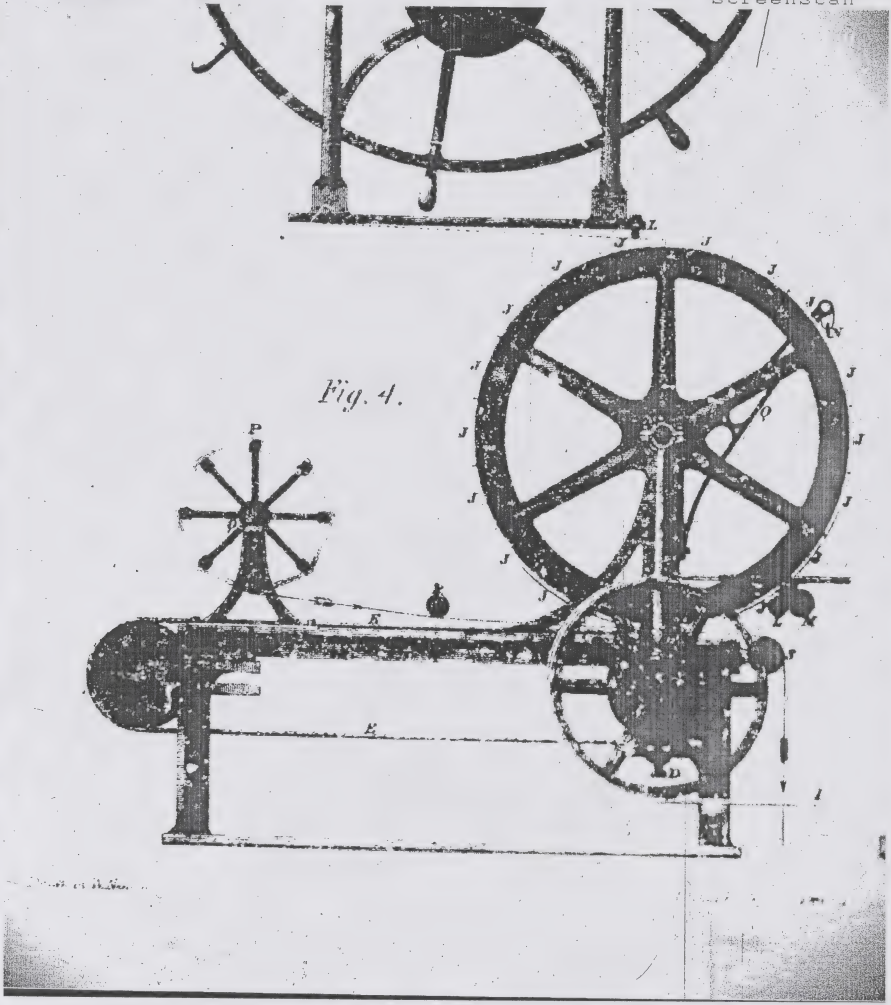
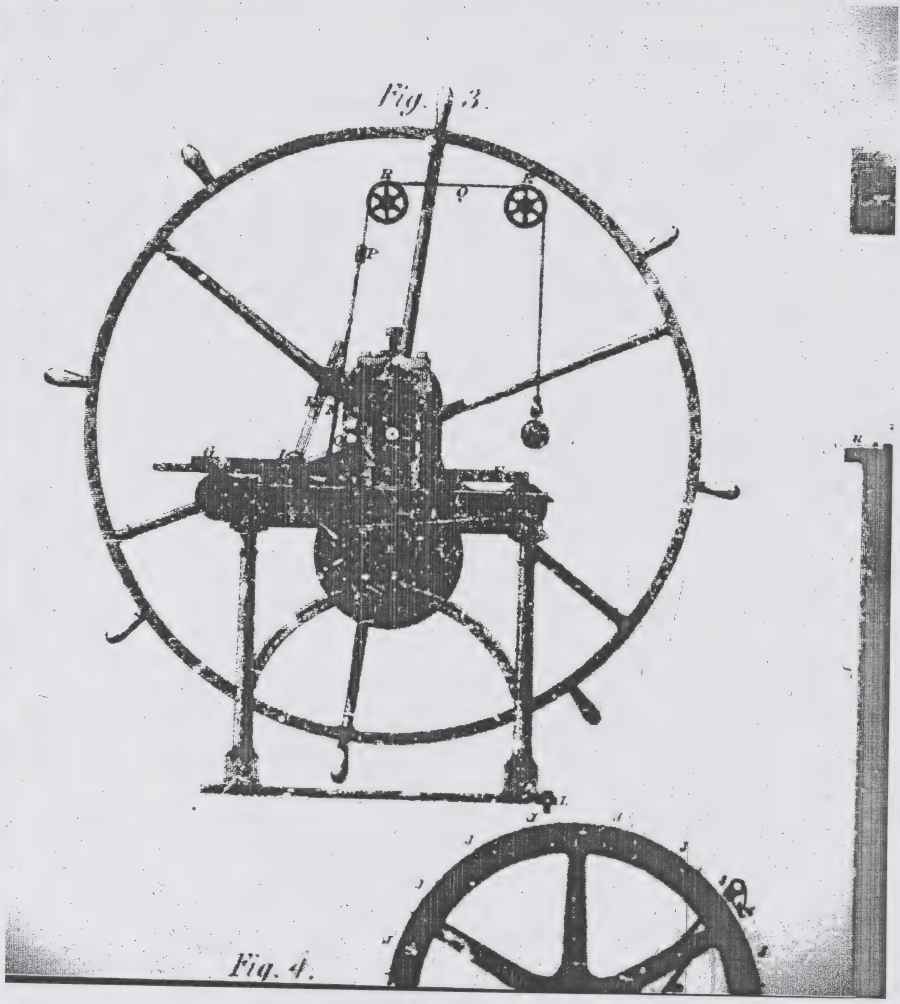
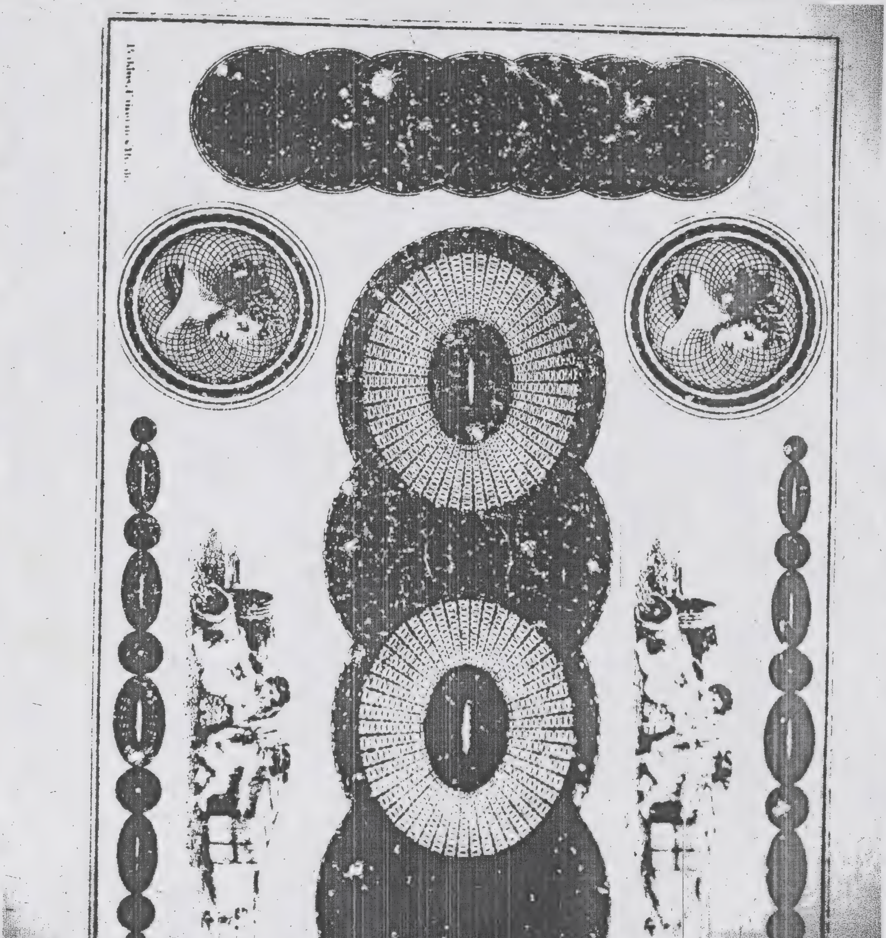
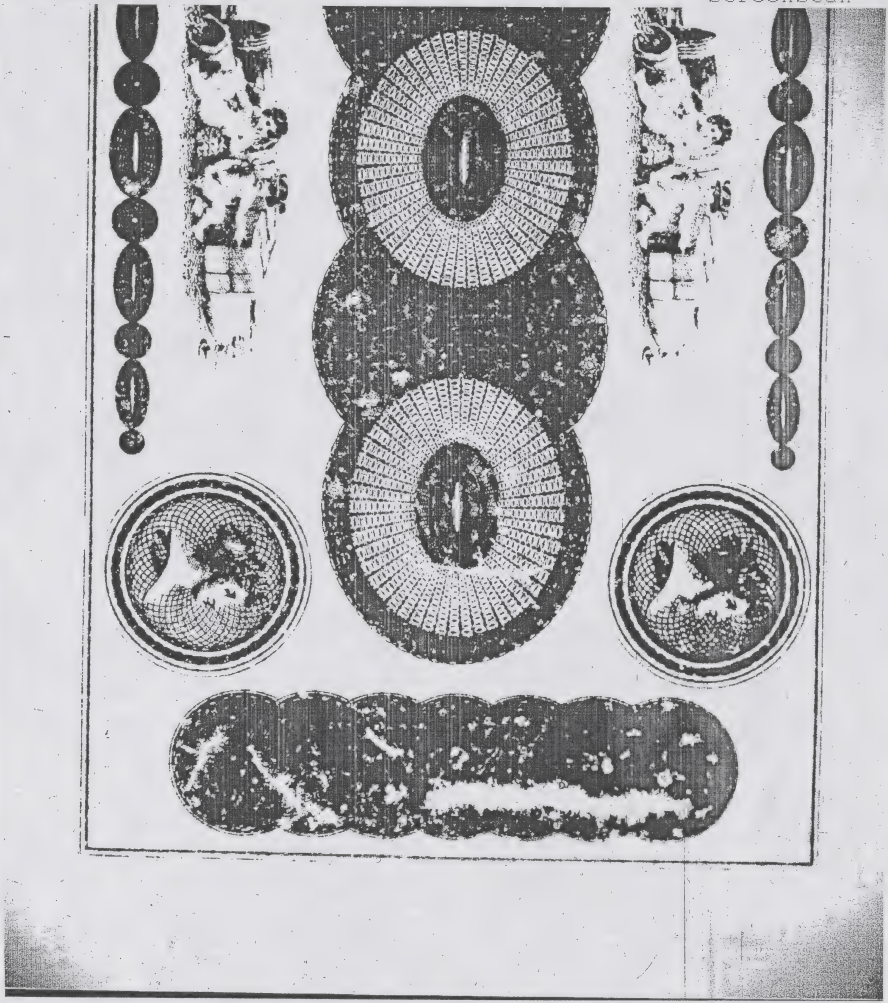


Fig. 4.







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the reel P; (the necks on the axes of which turn in semi-circular gaps or notches, made in the tops of standards affixed upon the frame of the machine, one of which is shewn at Q,) and passes beneath the directing roller R, until it reaches the press; after passing through which, and becoming printed, it finally passes over the roller S, to be taken away. The courses of the endless web or blanket E, E, &c. and of the long sheets of paper, are indicated by the arrows, which are shewn accompanying them in their progress. The standards which support the necks of the rollers K, L, M, and R, are omitted in the drawing, but must of course be employed in use.

In Plate VIII. Fig. 5, 6, 7 and 8, are represented parts of a circular coining press; in which Fig. 5, is an end view; Fig. 6, a side view; Fig. 8, a section of Fig. 5; and Fig. 7, a plan of the bed, lower die, and cutter. A, a cast-iron cylinder, containing the upper coining die, and male cutter. B, a cast-iron bed, containing the lower coining die, and female cutter. C, the adjusting bed. D, D, the adjusting wedges of the lower die. E, the lever, which turns upon a pin or stud at one end of it, and by moving upwards, raises the wedges D, D, and lower die, resting upon them. F, the upper coining die and male cutter. G, the lower coining die. H,

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the drawing,) and has a weight at the other end, (likewise not shewn,) which acts so as to raise the lower die G, and throw out the piece coined, after having received the impression. P, the adjustable bed *z*, of the vibrating lever press, described in Fig. 1 and 2. The cast-iron cylinder A, is applied on the under side of the vibrating lever K, of that press, by means of its cylindrical necks Q, Q, working in the gaps of the brass bearing box *l*, in the same manner as the die or roller *j*, there described; and it may be turned or rolled backwards and forwards, in the same manner, either by a double spanner, with circular holes in its ends, to fit upon the ends or the cylindrical necks Q Q; and which are prevented from slipping round thereon, by means of iron or steel webs or fins, fitted into grooves R, R, and made in the necks, and projecting above their surfaces; fitting into corresponding gaps, made in the holes in the ends of the spanner to receive them; or it may have a vibrating motion given to it, from any proper first moving power, by means of a lever, connecting rod, and crank; or other means, which need not be described here. A groove or channel S, is made around the cast iron cylinder A, to admit the slips of metal, out of which, the pieces are to be cut and coined, (and which

double spanner, with circular holes in its ends, to fit upon the ends or the cylindrical necks Q Q; and which are prevented from slipping round thereon, by means of iron or steel webs or fins, fitted into grooves R, R, and made in the necks, and projecting above their surfaces; fitting into corresponding gaps, made in the holes in the ends of the spanner to receive them; or it may have a vibrating motion given to it, from any proper first moving power, by means of a lever, connecting rod, and crank; or other means, which need not be described here. A groove or channel S, is made around the cast iron cylinder A, to admit the slips of metal, out of which, the pieces are to be cut and coined, (and which had previously been reduced to a proper width and thickness,) to pass freely; and it has a perforation through the centre of it, and at right angles to its axes, made of a proper shape, to receive the various parts enclosed within it, as before described; as well as two others, for the screws L, L, to act in. The cylinder revolves upon the bed B; its surfaces A, A, being always in contact therewith. The bed B, has a conical perforation T, T, made partly through it, shewn in

section at Fig. 8, to receive the conical elastic wedge J, and steel cylindrical ring or female cutter H; and a cylindrical hole U, at the bottom of the conical perforation T, T, to permit the lower die G, to move freely up and down in it. The lower face of the upper coining die F, has the head, &c. of the coin indented in it; and the upper face of the lower coining die G, has the reverse indented in it; and the slip of metal is first cut into a circular blank by the male cutter, or edge of the upper coining die, as it revolves, passing into the female cutter H, and acting partly as circular shears, and partly as the beds and punches of cutting presses, at the same time that the dies give the impression on each side of the blank; and when the cylinder has passed the lever E, by means of the weight affixed to it, as before described, raises the lower die G, with the coin upon it, a little above the top of the female cutter H, and it is carried forwards, in the hole in the slip of metal, out of which it was pressed or cut, and thrown off in its passage. The strip of metal is prevented from clinging to the upper die F, by two small hooks, under which the slip is passed, and which hooks are affixed on the bed B, though not there shewn. The upper wedge D, has necks or pivots at one end of it,

shears, and partly as the beds and punches of cutting presses, at the same time that the dies give the impression on each side of the blank; and when the cylinder has passed the lever E, by means of the weight affixed to it, as before described, raises the lower die G, with the coin upon it, a little above the top of the female cutter H, and it is carried forwards, in the hole in the slip of metal, out of which it was pressed or cut, and thrown off in its passage. The strip of metal is prevented from clinging to the upper die F, by two small hooks, under which the slip is passed, and which hooks are affixed on the bed B, though not there shewn. The upper wedge D, has necks or pivots at one end of it, V, V, which lodge or rest in gaps or notches made in two brasses, W, W, which are screwed upon the adjusting bed C; and which allow that wedge to play up and down, but prevent it from moving endways. X, is part of the arm *a*, described in the references to the drawing above.

(*To be concluded in our next.*)

slips or openings for the legs and connecting rods to move in; *c* and *d* are the legs or crutches; *e* and *f* are the rods which support the legs; *g* and *h*, are the double rods, by which the treddles are connected to the legs. The leg *c*, the supporting rod *e*, and the treddle rods *g*, are conjoined together by a pivot at *i*; the leg *d*, the supporting rod *f*, and the treddle rods *h*, are conjoined together at the pivot *k*. The action is effected as follows; press upon the treddle *a*, when the rod *g*, will bring down the pivot *i*, with the leg *c*, the rod *e*, and the rods *g*, into the situation of the dotted lines; the carriage being connected to the leg *c*, by the rod *e*, will, from this action of the leg and rods, be impelled forward; and, at the same time, by the pull of the cord *l*, (which passes through a sheave or pulley block *m*, and connects it at the two ends to the rods *e*, and *f*, and the arms *n*, and *o*,) the leg *d*, the rod *f*, the rod *n*, and the pivot *k*, will be brought up to the situation of *c*, *e*, *g*, and *i*, respectively ready for a stroke of the treddle *b*, which will also impel the carriage forward as above described; and this action being continued, will effect the rapid progressive motion of

by the pull of the cord *l*, (which passes through a sheave or pulley block *m*, and connects it at the two ends to the rods *e*, and *f*, and the arms *n*, and *o*,) the leg *d*, the rod *f*, the rod *n*, and the pivot *k*, will be brought up to the situation of *c*, *e*, *g*, and *i*, respectively ready for a stroke of the treddle *b*, which will also impel the carriage forward as above described; and this action being continued, will effect the rapid progressive motion of the carriage even against stones or a hill of considerable elevation.

Inrolled, April, 1820.

To JACOB PERKINS, *late of Philadelphia, &c. for certain Machinery for Eccentric Scroll Engraving, &c. including a Method of Softening and Hardening Plates or Blocks of Steel, applicable to the Production and Multiplication of Bank Notes.*

[*Concluded from page* 171.]

IN Plate XI. is represented an engine lathe, for engraving oval or circular geometrical figures upon metal or

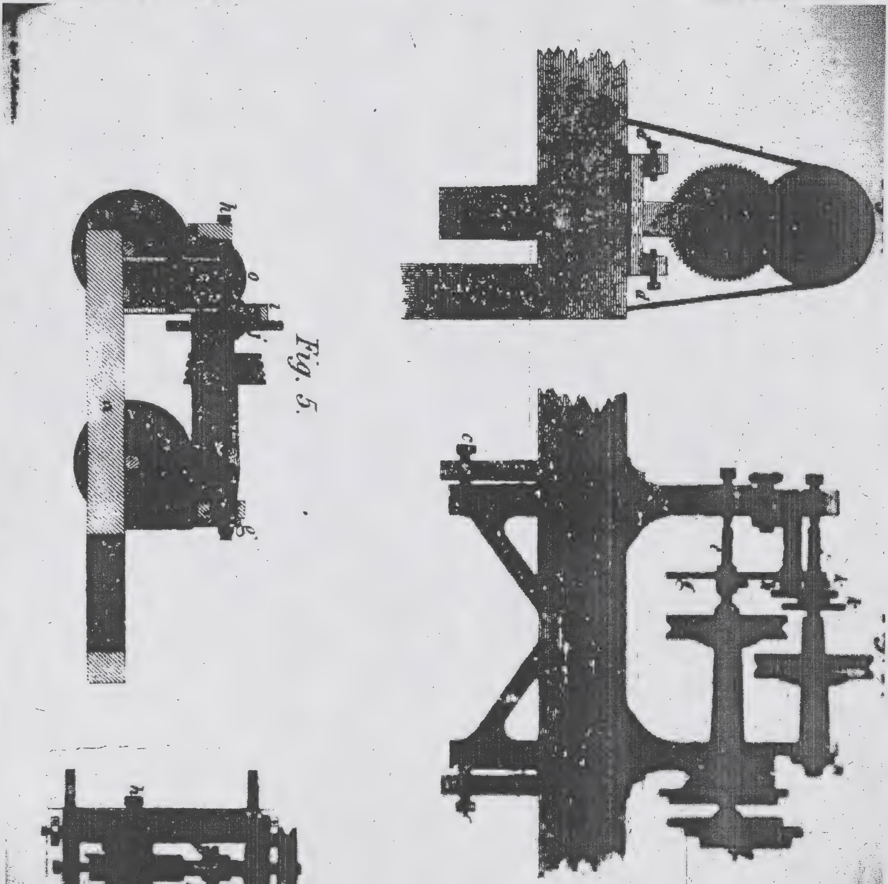

Fig. 5.

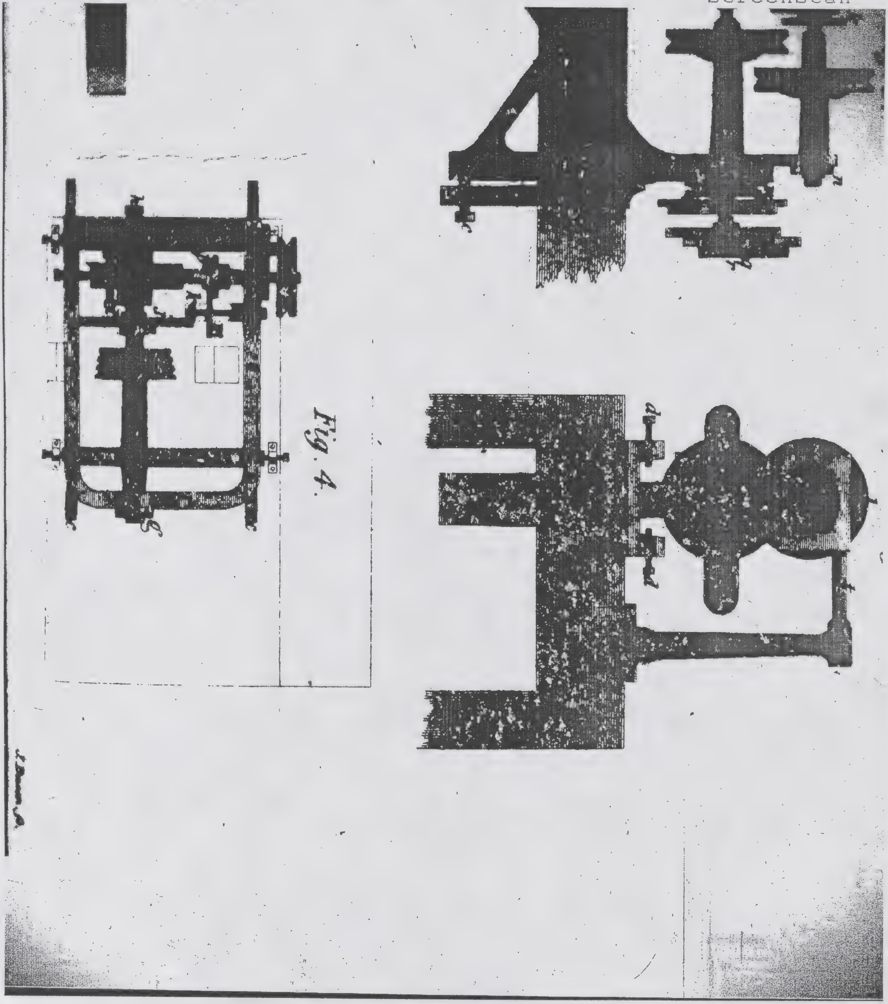

Fig. 4.

other surfaces, whether flat, convex, or concave: fig. 1, is a front view of the lathe.—Fig. 2, is an end view of the same, with the chucks and rest removed. Fig. 3, the opposite end view of the same.

(*a a.*) The bed of the lathe, *b b*, cheeks, or arms fixed in the lathe bed, to support the swinging parts of the lathe, which vibrates upon screws or pivots at *c c*; *d d*, are screws in the cheeks *b b*, to hold the swinging parts steady, when the toothed wheel-work is thrown out of gear, and the lathe is intended to be used as a common lathe; *e*, is the lathe mandrel; *f*, the whorl or pulley; *g*, the main toothed wheel, with its sliding socket, which can be fixed by a screw; *h*, the intermediate and connecting pinions, the arbor of which, acts in the adjusting frame or bracket, *i*, which is united with the swinging frame by a screw and nut; *j*, the upper mandrel, on which the several toothed wheels, *k k*, fixed upon a sliding socket, can be secured; *l*, the whorl or pulley of the upper mandrel; *m*, the collar of the lathe mandrel; *n*, the collar of the upper mandrel; *o*, the oval chuck formed as usual; *p*, the eccentric cylinder, and its moving plate, which is connected with the swinging frame by the adjusting screw and nuts; *q*, the adjusting chuck, to hold the plates, blocks, &c. to be engraved with a plate or block fixed thereto; *r s*,

common lathe; *e*, is the lathe mandrel; *f*, the whorl or pulley; *g*, the main toothed wheel, with its sliding socket, which can be fixed by a screw; *h*, the intermediate and connecting pinions, the arbor of which, acts in the adjusting frame or bracket, *i*, which is united with the swinging frame by a screw and nut; *j*, the upper mandrel, on which the several toothed wheels, *k k*, fixed upon a sliding socket, can be secured; *l*, the whorl or pulley of the upper mandrel; *m*, the collar of the lathe mandrel; *n*, the collar of the upper mandrel; *o*, the oval chuck formed as usual; *p*, the eccentric cylinder, and its moving plate, which is connected with the swinging frame by the adjusting screw and nuts; *q*, the adjusting chuck, to hold the plates, blocks, &c. to be engraved with a plate or block fixed thereto; *r s*, the roller, which slides in an oblong square upon the end of the upper mandrel, and can be moved more or less eccentric, and secured by means of an adjusting screw; *t*, an arm, screwed to a pillar which is fixed upon the bed of the lathe, and from which arm depends two vertical parts which hold a cheek *v*, let into a dove-tailed groove, and an adjusting elastic cheek *u*, which is retained in its place, by steady pins, and between which cheeks the eccentric roller *s*, revolves, and

causes the swinging parts of the lathe to vibrate more or less, according to its eccentricity.

The whorl on the upper mandrel, receives motion from a lathe-wheel below, not shown. One of the toothed wheels *k k*, upon that mandrel, works into the larger of the two intermediate pinions *h*, which are fixed upon one arbor, whilst the smaller of those pinions, works in the toothed wheel *g*, fixed upon the lathe mandrel. The turning or engraving tool, not shewn, must be held in a slide rest, with adjustments, as usual in other engine lathes, and which, therefore, need not be described here.

In order to produce a figure upon a flat concave or convex surface with this lathe, let one of the toothed wheels *k*, upon the upper mandrel, having 132 teeth, be connected with the larger of the intermediate wheels *h*, having 58 teeth; and let the smaller of those wheels *h*, having 32 teeth, take into the toothed wheel *g*, of 352 teeth, which is fixed upon the lathe mandrel *e*; and it will be found that four revolutions, and five-sixths of another, will be made by the wheel *k*, to one revolution of the lathe mandrel *e*: consequently, six revolutions of the lathe mandrel *e*, will complete the figure upon the surface of the body to be operated upon; and this, whether the figure be circular or oval, the latter

other engine lathes, and which, therefore, need not be described here.

In order to produce a figure upon a flat concave or convex surface with this lathe, let one of the toothed wheels *k*, upon the upper mandrel, having 132 teeth, be connected with the larger of the intermediate wheels *h*, having 58 teeth; and let the smaller of those wheels *h*, having 32 teeth, take into the toothed wheel *g*, of 352 teeth, which is fixed upon the lathe mandrel *e*; and it will be found that four revolutions, and five-sixths of another, will be made by the wheel *k*, to one revolution of the lathe mandrel *e*: consequently, six revolutions of the lathe mandrel *e*, will complete the figure upon the surface of the body to be operated upon; and this, whether the figure be circular or oval, the latter depending upon the eccentricity of the oval chuck.—The intermediate wheels *h*, may be removed, and the largest of the wheels *k*, can be connected with the wheel *g*, and will produce a different figure, which may be also varied by the eccentricity of the cylinder *p*, being made greater or less; as well as by causing other of the toothed wheels and pinions to be connected together; and thus an infinite variety of figures may be produced.

In operating upon convex or concave surfaces, the

turning tool, in the slide rest ought to be acted upon, by a spring and regulating gauge, so as to cause it to follow up the varying surfaces.

At figs. 4 and 5, is represented another engine lathe, for engraving certain figures upon the peripheries of metal or other cylinders.—Fig. 4. is a plan of it, with the hand and wheel, and its carriage removed, and part of the wooden frame broken off.—Fig. 5, is a longitudinal section of the same, the front of the carriage being removed to shew the parts more distinctly.

The supporting frame, the foot-wheel, the crank, axis, &c. being common to other lathes, is either not shewn, or not referred to; *a*, the cast iron bed of the lathe; *b b*, two upright metal blocks, firmly secured by screws, to the cast iron bed; *c c c c*, four cylindrical rollers, of equal size, fixed in pairs, upon the two spindles *d d*, which turn upon the conical points of the four adjusting screws, as centres. Upon these four rollers *c c c c*, the vibrating carriage of the lathe *e e e e*, is supported and guided, by means of two short steel bars, which are affixed on the under side of the carriage, and move between four steel bars upon the upper surfaces of the blocks *b b*, two of which bars are fixed and the others are moveable; the motion of the carriage *e e*, is thus secured, in a line

moved to shew the parts more distinctly.

The supporting frame, the foot-wheel, the crank, axis, &c. being common to other lathes, is either not shewn, or not referred to; *a*, the cast iron bed of the lathe; *b b*, two upright metal blocks, firmly secured by screws, to the cast iron bed; *c c c c*, four cylindrical rollers, of equal size, fixed in pairs, upon the two spindles *d d*, which turn upon the conical points of the four adjusting screws, as centres. Upon these four rollers *c c c c*, the vibrating carriage of the lathe *e e e e*, is supported and guided, by means of two short steel bars, which are affixed on the under side of the carriage, and move between four steel bars upon the upper surfaces of the blocks *b b*, two of which bars are fixed and the others are moveable; the motion of the carriage *e e*, is thus secured, in a line parallel to the axis of the mandrel of the lathe. Four steel plates are also fixed on the under side of the carriage, which move upon the tops of the four rollers. The large conical end of the lathe mandrel *f*, works in a steel collar at *g*, secured to one end of the carriage, and its smaller end works in a conical hole, made in the adjusting screw *h*; on the larger end of the mandrel *f*, is a male screw *g*, on which the chucks are fixed; and it has also a pulley or whorl *i*, upon it, which is intended to receive motion occasionally by a band from a foot wheel; it has

also a toothed wheel *j*, fixed to a sliding socket with a binding screw upon it, which gives motion to an intermediate pinion, *k*, at right angles to it, which is fixed upon an arbour turning in pivot holes in a bracket *l*, that is secured to the carriage. On the same arbor is likewise attached the toothed wheel *m*; *n*, is an arbor, placed at right angles with the mandrel, having a nick, at one end of it with a shoulder, working in and through a steel collar, which is fixed to the side of the carriage; its other end has a conical hole turning upon the conical point of an adjusting screw as a centre. On the outer end of this arbor *n*, is fixed the pully *o*, which receives motion by means of a band wheel to be supported on a carriage or frame fixed to a lathe bed, but not shewn. On the arbor *n* is attached a sliding socket, having an adjusting screw, and upon which socket are fixed the three toothed wheels *p*; there is likewise fixed upon a square on the arbor *n*, a cylinder *q*, which can be moved eccentric, by means of its adjusting screw, in any situation, between the shoulder of the arbor and the nut *r*, which is screwed upon the end of it: this cylinder *q*, revolves between two steel upright plates *s* and *t*; the first of which *s*, is firmly fixed by screws, to one of the blocks; whilst the latter *n*, is so fixed to it, that its upper part, which is made sufficiently thin to be elastic, can yield a

end of this arbor *n*, is fixed the pully *o*, which receives motion by means of a band wheel to be supported on a carriage or frame fixed to a lathe bed, but not shewn. On the arbor *n* is attached a sliding socket, having an adjusting screw, and upon which socket are fixed the three toothed wheels *p*; there is likewise fixed upon a square on the arbor *n*, a cylinder *q*, which can be moved eccentric, by means of its adjusting screw, in any situation, between the shoulder of the arbor and the nut *r*, which is screwed upon the end of it: this cylinder *q*, revolves between two steel upright plates *s* and *t*; the first of which *s*, is firmly fixed by screws, to one of the blocks; whilst the latter *n*, is so fixed to it, that its upper part, which is made sufficiently thin to be elastic, can yield a little, so as to prevent the eccentric cylinder from binding or shaking between the plates *s* and *t*.—When the arbor *n*, is turned round, and the cylinder *q*, is concentric with it, the carriage *e*, will remain at rest; but, on the cylinder being made eccentric to the arbor, as shewn at fig. 5. the carriage will vibrate backwards and forwards, upon the four rollers *c c*, double the distance of the eccentricity of the cylinder; and, as the lathe mandrel is carried round at the same time, by means of the train of toothed wheels before described, any cylindri-

cal body screwed upon the end of the mandrel, at *g*, will receive waved lines upon its periphery, from the point of any proper turning tool, fixed in a slide rest, as usual in engine lathes; and, therefore, need not be described here: the waved lines, will vary according as the cylinder *g*, is made more or less eccentric, the difference of the velocity of the mandrel *f*, and arbor *n*, made greater or less, and the diameter of the cylindrical body to be operated upon; or by any one, two or three of these changes being made, together or separately.—Thus, let the middle toothed wheel *p*, of one hundred teeth, upon the arbor *n*, fig. 4, be connected with the intermediate wheel *m*, having one hundred and eighty teeth; and let the pinion *k*, of thirty-two teeth, fixed upon the same arbor as the wheel *m*, be connected with the wheel *j*, of three hundred and fifty-two teeth, fixed upon a lathe mandrel *f*, then the difference of velocity between the toothed wheel *p*, and the lathe mandrel *f*, will be as nineteen and four-fifths to one.—And as a motion backwards and forwards, endways, is given to the mandrel *n*, at every revolution of the arbor *f*, so, consequently, nineteen and four-fifths waved lines, will be made round the periphery of the cylindrical surface, to be operated upon, at each revolution of the mandrel *n*; and, as the last waved line falls short one-fifth at each revolution, it will take five revolutions of the mandrel *n* for the graving tool to enter

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In order to de-carbonate the surfaces of cast steel plates, cylinders, or dies, by which they are rendered much softer, and fit for receiving either transferred or engraved designs, the patentee discovered that pure iron filings, divested of all foreign or extraneous matters, produce the softest de-carbonated surface; and therefore, he proposes the use of iron filings as pure and as free from rust as

can be obtained, carefully excluding all carbonaceous matter, and any substance from which carbon can be obtained.

The stratum of de-carbonated steel, should not be too thick for transferring fine and delicate engravings: for instance, not more than three times the depth of the engraving. The surface of the steel may be de-carbonated to any required thickness.

To de-carbonate it to a proper thickness for fine engravings, it is to be exposed for four hours to a white heat, enclosed in a cast-iron box, with a well closed lid. The sides of the cast-iron box, are made at least three quarters of an inch in thickness, and at least a thickness of half an inch of pure iron filings, should cover or surround the cast steel surface to be de-carbonated. The box is to be suffered to cool very slowly, which may be effected, by shutting off all access of air to the furnace, and covering it with a layer, six or eight inches in thickness, of fine cinders. Each side of the steel plate, cylinder or die, must be equally de-carbonated to prevent it from springing or warping in hardening. It is also found that the safest way to heat the plates, cylinders, or dies, is in a vertical position.

The Patentee makes use of good cast steel, in prefer-

The sides of the cast-iron box, are made at least three quarters of an inch in thickness, and at least a thickness of half an inch of pure iron filings, should cover or surround the cast steel surface to be de-carbonated. The box is to be suffered to cool very slowly, which may be effected, by shutting off all access of air to the furnace, and covering it with a layer, six or eight inches in thickness, of fine cinders. Each side of the steel plate, cylinder or die, must be equally de-carbonated to prevent it from springing or warping in hardening. It is also found that the safest way to heat the plates, cylinders, or dies, is in a vertical position.

(36)

The Patentee makes use of good cast steel, in preference to any other sort of steel, for the purpose of making plates, cylinders, circular or other dies, and more especially when such plates, cylinders, or dies are intended to be de-carbonated. For the reason given above, the steel is de-carbonated, solely for the purpose of rendering it sufficiently soft for receiving any impression intended to be made thereon. It is therefore necessary that, after any piece of steel has been de-carbonated, whether it be in the shape of an engraved plate, or a cylinder, or a die with engraved, or other figures upon its surface, in order to receive such figures, &c. it should be again car-

bonated, or re-converted into steel capable of being hardened. In order, therefore, to effect this carbonization or re-conversion into steel, the following process is employed: a suitable quantity of leather is to be converted into charcoal by the well known method of exposing it to a red heat, in an iron retort for a sufficient length of time, or until all the evaporable matter is driven off from the leather. Having thus prepared the charcoal, it is reduced to a very fine powder; then, take a box made of cast iron of sufficient dimensions to receive the plate, cylinder or die, which is to be reconverted into steel, so as that the intermediate space between the sides of the said box, and the plate, cylinder or die, may be about one inch. This box is to be filled with the powdered charcoal, and having covered it with a well fitted lid, let it be placed in a furnace similar to those used for melting brass, when the heat must be gradually increased until the box is somewhat above a red heat; it must be suffered to remain in that state, till all the evaporable matter is driven off from the charcoal. Then remove the lid from the box, and immerse the plate, cylinder or die in the powdered charcoal, taking care to place it as nearly in the middle as possible, so that it may be surrounded on all sides by a stratum of the powder of nearly an uniform thickness. The lid being replaced the box with the plate

sions to receive the plate, cylinder or die, which is to be reconverted into steel, so as that the intermediate space between the sides of the said box, and the plate, cylinder or die, may be about one inch. This box is to be filled with the powdered charcoal, and having covered it with a well fitted lid, let it be placed in a furnace similar to those used for melting brass, when the heat must be gradually increased until the box is somewhat above a red heat; it must be suffered to remain in that state, till all the evaporable matter is driven off from the charcoal. Then remove the lid from the box, and immerse the plate, cylinder or die in the powdered charcoal, taking care to place it as nearly in the middle as possible, so that it may be surrounded on all sides by a stratum of the powder of nearly an uniform thickness. The lid being replaced, the box with the plate, cylinder, or die, must remain in the degree of heat before described for from three to five hours, according to the thickness of the plate, cylinder or die, so exposed. Three hours are sufficient for a plate of half an inch in thickness, and five hours when the steel is one inch and a half in thickness. After the plate, cylinder, or die, has been thus exposed to the fire for a sufficient length of time, take it out from the box, and immediately plunge

it into cold water. It is important here to observe, that it is found by experience that the plates or other pieces of steel, when plunged into cold water, are least liable to be warped or bent, when they are held in a vertical position, or made to enter the water in the direction of their length. If a piece of steel, heated to a proper degree for hardening, be plunged into water and suffered to remain there until it becomes cold, it is found by experience to be very liable to crack or break, and in many cases it would be found to be too hard, for the operations it was intended to perform. If the steel cracks or breaks it is spoiled. In order to render it fit for use, (if by accident it becomes too hard,) should it happen not to be broken in the hardening, it is the common practice to heat the steel again, in order to reduce or lower its temper, as it is technically called. The degree of heat to which the steel is now exposed, determines the future degree of hardness, or the temper, and this is indicated by a change of colour upon the surface of the steel. During this heating, a succession of shades is produced from a very pale straw colour to a deep blue. It is found, however, by long experience that, (on plunging the heated steel into cold water, and suffering it to remain there no longer than is sufficient for lowering the temperature of the steel to the same degree

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learned by actual observation, as the workman must be guided entirely by the kind of hissing or singing noise, which the heated steel produces in the water while cooling. From the moment of its being first plunged into the water a varying sound will be observed; and it is at a certain tone before the noise ceases, that the effect to be produced is known. The only directions which can be given, whereby the experimentalist can be benefited, are as follow: namely, to take a piece of steel which has already been hardened by remaining in the water till cold, and, by the common method of again heating it, to let it be brought to the colour which would indicate the desired temper of the steel plate to be hardened by the above process; as soon as he discovers the colour to be that of pale yellow, or straw colour, to dip the steel into water, and attend carefully to the hissing, or as some call it, singing noise, which it occasions; he will then be better able, and with fewer experiments, to judge of the precise time at which it should be taken out. It is not meant to be understood that the temper indicated by a straw colour, is that to which the steel plate, cylinder, or die, should be reduced, because it would then be found too hard; but merely that the temperature which would produce that colour, is that by which the

cold, and, by the common method of again heating it, to let it be brought to the colour which would indicate the desired temper of the steel plate to be hardened by the above process; as soon as he discovers the colour to be that of pale yellow, or straw colour, to dip the steel into water, and attend carefully to the hissing, or as some call it, singing noise, which it occasions; he will then be better able, and with fewer experiments, to judge of the precise time at which it should be taken out. It is not meant to be understood that the temper indicated by a straw colour, is that to which the steel plate, cylinder, or die, should be reduced, because it would then be found too hard; but merely that the temperature which would produce that colour, is that by which the peculiar sound would be occasioned, when the steel should be withdrawn from the water for the first time. Immediately on withdrawing it from the water, the steel plate, cylinder, or die, must be laid upon or held over a fire and heated uniformly, until its temperature is raised to that degree, at which tallow would be decomposed; or, in other words, until smoke is perceived to arise from the surface of the steel plate, cylinder, or die, after having been rubbed with tallow. The steel plate, cylinder, or die, must then be again plunged into

water, and kept there until the sound becomes somewhat weaker than before. It is then to be taken out and heated a second time to the same degree, and by the same rule of smoking tallow as before, and the third time plunged into water, till the sound becomes again weaker than the last. Expose it a third time to the fire as before, and for the last time return it into the water and cool it; after it is cooled, clean the surface of the steel plate, cylinder, or die; and by heating it over the fire, the temper must be reduced by bringing on a brown, or such other lighter or darker shade of colour, as may best suit the quality of the steel, or the purpose to which it is to be applied.

Although a particular description of the process employed for hardening or tempering steel plates, cylinders, or dies, is set forth in the specification, and the patentee believes the major part of the process to be new, yet he does not claim any of the privileges granted to him in the patent, for the exclusive use of the said process, but freely gives it to the public for their use and benefit, in every branch of manufacture except that for which his Patent is taken, viz. Dies and Bank Note Plates.

Inrolled, April, 1820.